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SCIENCE & TECHNOLOGY

USSR: COMPUTERS

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LARGE SOVIET COMPUTERS REVIEWED

Paris 01 INFORMATIQUE in French 8 Sep 86 p 94

[Article by Josip Rajman: "The Large Soviet Computers"]

[Text] After presenting the microelectronics industry of the largest country in the world (22.4 million km^2), 01 INFORMATIQUE examines in this article the large soviet computers.

In 1969 as part of COMECON, six European socialist countries formulated a cooperation agreement in the computer area, known as the Unified System of Electronic Computers (USEC), also known as YES, or RYAD. It is managed by an intergovernmental committee.

In 1973, the first six YES systems were shown in Moscow; they were equivalent to the IBM 360 series (with which they were in fact compatible) and its associated peripherals. All these models were later named the YES-1 series. More recently, in 1979, new systems were combined to form the YES-2 series, comparable to the IBM 370. Other systems, technologically more sophisticated and whose fabrication has already begun, will form the YES-3 series.

Today, the Soviet Union produces two types of large systems: older, improved models, and the recent systems.

All these models use OS and DOS operating systems and accept the COBOL, FORTRAN, PL/1, and RPG languages, various assemblers, and in some cases, the ALGOL language. They all use magnetic tapes and disks, but the oldest models also accept paper data inputs.

The YES-1022 is a multitasking system: 15 tasks under OS and three under DOS (the removable disk has a 29 Mb capacity and the printers can output 1200 lines/min). All the other models have at least the same characteristics. The YES-1033 is an improved YES-1030 computer in the Russian-Polish YES-1 series.

All the systems described below have a virtual memory of up to 16 Mb and an automatic error detection system.

Systems Produced

Old, improved systems:

YES Model	Main Memory (virtual = v)	Mps
1022	256-512 Kb	0.08
1033	256-512 Kb	0.14 - 0.2
1035	256-1024 Kb (v 16 Mb)	0.14 - 0.18
1060	2-8 Mb (v 16 Mb)	1.3

Latest models:

YES Model	Main Memory (virtual = v)	Mps
1035.01	1-2 Mb (v 16 Mb)	0.19
1045.01	1-4 Mb (v 16 Mb)	0.86
1061	8 Mb (v 16 Mb)	1.5
1065	16 Mb (v 16 Mb)	6.0

The YES-1035, with multiprogramming for three tasks, was designed primarily for the many users of the second generation soviet system Minsk 32, with which it is fully compatible. Operands can have as many as 128 binary figures for floating point calculations.

The YES-1060 can be connected to other units; the multiplex channel works equally well with several I/O units simultaneously, as it does in direct mode, with a single channel operating with a single unit at one time. This system has 224 multiplex sub-channels and two selection sub-channels. A single selection channel controls up to 10 external devices (maximum transfer rate of 1.25 Mb/sec).

In the YES-1035.01, indirect addressing allows address translation during I/O operations. This also applies to all the following systems, which use mainly 100 Mb Bulgarian disks.

The YES-1045.01 has two eight-bit multiplex channels (40-120 Kb/sec), and four multiplex block channels (1.5 Mb/sec). A dual processor system of this type has a main memory and common external storage. It is controlled by a single operating system. A vector processor can also be connected to accelerate simultaneous processing in similar operations on different elements in a particular structure (this processor uses fast algorithms and pipelining of arithmetic operations).

The YES-1061 has two multiplex eight-bit channels (100-500 Kb/sec) and six multiplex block channels (up to 3 Mb/sec). Thanks to them, it is possible to build a complex system capable of using microprogram oriented processors, interactive mode, real time, and time sharing.

The YES-1065 is available with two or four processors. While the main memory reaches 16 Mb, the capacity of the I/O system is 30 Mb. The largest system of this type has one to four multiplex eight-bit channels. The control board and the service processor have their own peripherals.

Peripherals from Czechoslovakia, Hungary, Bulgaria, and GDR

Hundreds of peripheral models have been built as part of the Unified System, most of them compatible with all the YES central processing units, within their capabilities, of course. Some examples are several primarily Russian models among the most current or most recent ones, used mainly with large systems. Their mdoel numbers are all preceded by YES, which means that after testing, they have been incorporated into the Unified System.

Several supports are available for external storage. Magnetic tapes have the usual density of 32/63 bits/mm, and a speed of 2-3 m/sec. The cassettes provide a total storage capacity of 16,000 bytes. Matrix printers and small magnetic tape storage units can be connected to them. Almost all the IBM-compatible disks are available, with the largest (100-200 Mb) being Bulgarian.

Diskettes meet the ISO 209 standard. All sorts of terminals are available which have the usual specifications for various modes: with or without intermediate memory, generally with a resolution of 1920 (as well as 1024 x 1034). Line printers operate at 700, 820, 1110, and 1200 cps.

Others, from Czechoslovakia, Hungary, and GDR, complete the range of series printers (especially for 180 cps). There is also a good selection of plotters, with pens for 0.3, 0.5, and 0.8 mm. A table plotter works with 1050 x 1000 mm paper, and a drum plotter uses 380 mm-wide by 80 m-long paper. A three-color graph drafting table draws on an area of 494 x 420 mm.

For communications users have an YES-8371 unit of Bulgarian origin. It provides a one microsecond execution cycle, word lengths of 16, 18, or 20 bits, a memory of 256-1024 Kb, 2 to 352 communication channels, and transmission rates of 50-48,000 bauds.

Many new peripherals are being tested, and are even in service, but still awaiting YES classification. All the equipment mentioned above, and many other devices, can be exported by ELORG (Electronorgtechnika, SU 12100 Moskva G 20).

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SP-8 SIGNAL PROCESSOR

Novosibirsk AVTOMETRIYA in Russian No 4, Jul-Aug 86 (manuscript received 14 Feb 86) pp 27-32

[Article by A. V. Berezovskiy, V. A. Kozlachkov, I. I. Korshever and S. A. Pavlov, Novisibirsk]

[Abstract] The SP-8 signal processor was developed in 1984 at the Institute of Automation and Electronics, Siberian Division, USSR Academy of Sciences. It has a capacity of 10 million operations per second, and is oriented towards the bus of the "Elektronika-60" microcomputer. The processor is constructed using two double format Elektronika-60-style printed circuit boards. The main element of the SP-8 is an arithmetic conveyor consisting of an ALU, two registers and a multiplier, connected to each other and to main and table memory by means of a set of software-controlled multiplexors, allowing flexible conveyor operation of the device. The ALU is an 1804VS1 microprocessor with 16 internal registers and a rich set of microinstructions. A 1802VR5 16 x 16 matrix multiplier chip is used. The software supplied with the device includes a standard mathematical library of more than 30 programs for digital signal processing, a debugger, memory test and functional processor testing programs. The clock frequency of the device is 5 MHs, a Fast Fourier Transform on a complex 1024 point vector is performed in 13.5 milisec., memory is 128K 16-bit words, table memory is 4K words, the microinstruction ROM is 2K words, and power consumption is 5W. Figure 1, references: 5 Russian.

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UDC 681.3

24-BIT CAMAC STANDARD COMPUTER

Novosibirsk AVTOMETRIYA in Russian No 4, Jul-Aug 86 (manuscript received 3 Feb 86) pp 32-38

[Article by G. S. Piskunov and S. V. Tararyshkin, Novosibirsk]

[Abstract] Since 1971, the Institute of Nuclear Physics, Siberian Division, USSR Academy of Sciences, has been using Polish "Odra-1300" computers, similar to the English ICL-1900, to control large physical experimental installations. Development of systems based on the Odra-1300 is continuing by decentralization using CAMAC autonomous peripheral controllers, allowing integration of CAMAC devices with these universal computers. In 1981, the decision was made to develop an autonomous 2-M width CAMAC device controller compatible at the user program level with the Odra-1300 computer. This device, called the "Odrenok," is based on 130 LSI and MSI devices, has 64K 24-bit words internal memory and implements the full Odra-1300 machine instruction set. It does 300,000 fixed point operations per second, and reaches about half the throughput of the high-end Odra-1305 on floating point operations. Ninety of the "Odrenok" devices are now in use at the institute in distributed electrophysical installation control systems, as engineering workstations used in designing and adjusting electronic apparatus, and also in scientific workers personal workstations. Although not originally planned as an independent computer, the implementation of the full Odra-1300 instruction set has allowed the machine to run Odra-1325 programs with many floating-point operations at 30-50% speed. The time needed to execute a Fortran program for funding simple numbers is as follows on the following machines: YeS-1061, 1.7 sec; BeSM-6, 2.6 sec; Elektronika 79, 3.3 sec; Osdenok, 7.6 sec; Odra-1305, 8.5-8.8 sec.; and Elektronika 100/25, 12.4 sec. Figures 4, references 5: 4 Russian, 1 Western.

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UDC 681.31.001.8

COMMUNICATIONS HARDWARE IN MULTIPROCESSOR STANDARDIZED INTERACTIVE 'KULON' TYPE GRAPHIC SYSTEMS

Novosibirsk AVTOMETRIYA in Russian No 4, Jul-Aug 86 (manuscript received 15 Jul 85) pp 105-109

[Article by A. M. Vlasov, V. A. Dyboy, V. Ye. Mezhov, V. V. Plotnikov, N. L. Ratmirov and V. N. Kharin, Voronezh]

[Abstract] The organization of computational processes related to design using interactive graphic systems allows one central computer to process information from 8 microcomputer workstations performing several projects

or stages of a single project simultaneously. In designing communications hardware and software, a goal was established of assuring simple communications structure, high speed exchange of large files of information using little processor time in processing exchange requests, high reliability and viability and the capability to be built into standard micro- and minicomputer designs. The radial principle of connecting various computers with asynchronous sequential information transfer in dialogue mode and file mode was selected. The hardware selected allows creation of multi machine systems for the construction of powerful interactive graphic system. The system is based on an Elektronika-60M at the lower level and an Elektronika 79 at the higher level. Figures 3, references: 2 Russian.

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AUTOMATED WORKSTATION FOR STATISTICAL DATA PROCESSING

Moscow VESTNIK STATISTIKI in Russian No 11, Nov 86, pp 37-43

[Article by D. Dayitbegov, candidate of economic sciences, department head; S. Yasenovskiy and S. Mizrokhi, graduate students, Moscow Economic-Statistics Institute]

[Abstract] The Department of Computer Software, Moscow Economic-Statistics Institute has developed an automated workstation intended for statistical processing of data, teaching of statistical methods of analysis, for utilization in the scientific research work of teachers, graduate students and other users. The workstation is based on a YeS-1840 or compatible personal computer. The orientation of the workstation is determined by its software, since it is based on a universal personal computer. The basis of the software is a 99X26 capacity spread sheet processor with a graphic processor and software for statistical analysis such as regression analysis, cluster analysis and correlation analysis.

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COMPUTER SPEAKS AND LISTENS

Riga NAUKA I TEKHNIKA in Russian No 11, Nov 86 pp 16-17

[Article by Ivar Yanovich Bilinskiy, deputy director of scientific work at the Institute of Electronics and Computer Technology of the Latvian SSR Academy of Sciences; first paragraph, NAUKA I TEKHNIKA introduction. Under a picture of Bilinskiy it is said that he was born in 1934 in Ekabpils, graduated from Leningrad Northwest Correspondence Polytechnical Institute in 1962, and defended his dissertation in 1978 for the Doctor of Technical Sciences degree.]

[Text] Systems that make it possible for humans to establish voice contact with technology have been developed on the basis of new-generation "intelligent" computers. These systems must also perceive living speech and learn to "speak."

The process of programming is very complicated. Therefore, the attempt has been made to simplify interaction with the computer and to adapt it to humans by teaching it to speak and understand speech.

Today telephone and nontelephone conversations with computers are no longer in the sphere of scientific fantasy. There are more than a few methods and hardware that make it possible to establish one- or two-way communication with a computer in ordinary human language. This is not a simple matter, however, and there are still many problems. Take, for example, at least this one: Having conversations with computers is expensive, and in reality, many such experiments have not extended beyond laboratory walls. The technology for speech communication with computers will be developed for widescale introduction into practice; however, it is already possible to talk about some of its fundamental principles today.

Even an acoustic device connected to a computer pronounces understandable human words, which still does not mean that the machine "speaks" in the full meaning of the word. A computer memory may be used to restore speech analogously to a magnetic tape, and then the record may be produced as sound on a tape recorder. However, this analogy is not a literal one.

The methods of writing an acoustic signal with the help of a tape recorder and a computer differ significantly. In both cases, the sound is first converted

by means of a microphone into a continuously changing electrical voltage. In a tape recorder, such a signal is recorded directly onto magnetic tape. However, before the signal can be input into a computer it must be additionally converted into digital values that follow one another after specified time intervals. The computer "remembers" these digits and outputs them in response to a request. Only after the computer first obtains these ordered digital values from memory and converts them by means of special devices can it obtain an acoustic signal, i.e., a sound.

At first glance it seems strange that living speech and music are recorded by using barren digits. It turns out, however, that this is not only possible but desirable inasmuch as the amount of processing and restoration of sonograms stored in computer memory (speech or music) is significantly greater than with other means of recording. Fewer units of information, bits, are expended just to describe a speech signal, and significantly more for coding music. The greater the requirements for precision of converting sonograms, the more bits in the sequence of digital values. For example, the quality of coded speech is acceptable at an expenditure of 64,000 bits per second. With such recording, the memory of a minicomputer is only sufficient for calculated minutes.

This means that it is only feasible to input signals into a computer under conditions such that the result justifies the means and that a significant effect is attained. Special data compression is used to switch to more economical methods for the discrete representation of sonograms.

Of course, it is not feasible to use a computer to store speech-grams analogously to a tape recorder. It is another matter when speech is input into a computer that is connected to an information computer network. Here the computer serves mainly to provide on-line information exchange and access to data banks and to information-processing systems. Besides different data files, it is often necessary to send an image and speech along such networks. In this case, a message uttered by a voice is input into the computer and sent to an addressee. The necessity of storing speech-grams in a computer memory arises only when the addressee is not there and the speech-gram must be sent at another time upon request. In this case, the task of providing data compression and representing the speech signals in a discrete form more economically is also very pressing.

What does any conversation represent? It may be conditionally divided into the uttering of words and the perception of what is spoken.

Initially, a child learns to understand speech and only then does he or she gradually master the art of uttering it coherently. With a computer, it is the other way around. It is easier to teach the computer to speak than to understand words or phrases uttered by a voice. Today, such work is already underway using various special methods. We will examine the simplest method of speech synthesis, the compilation method.

A set of words and some word combinations pronounced by an announcer is written into the computer's memory. By choosing the required sequence of sonograms from the computer's memory, it is possible to construct, and

afterwards restore, messages uttered by a voice. They will sound like the announcer's text.

Such speech synthesis systems are used in acoustic address systems, for example, in railroad stations, on transport systems, and in airports. Their relative simplicity is their advantage. However, they have their disadvantages, such as a rather narrow range of use on account of the limited reserve of synthesized words.

There have already been a number of achievements in the development of speech synthesis systems, e.g., when a voice "reads" ordinary text that is not limited to a dictionary that has been input into a computer. This method differs substantially from the former and is based on the results of extensive scientific research on the processes of speech formation and the regularities of linguistics. Generalized knowledge in this field has made it possible to develop an algorithm, a set of rules for speech synthesis according to a specified orthographic text. The program algorithms developed on this basis are input into a computer and used to convert source text material. The first of these conversions involves automatic conversion from orthographic to phonemic text (of course, a word is not always pronounced as it is written). Using the phonemic text, the computer controls the speech formation. By using alternating voltage, and then acoustic oscillations, sounds that are perceived as words uttered by a voice are produced.

The speech formation apparatus in humans represents a complex acoustic system. Therefore, it is not easy to construct a simple model that is appropriate for practical use and that would also suffice for precisely reproducing human speech.

Attempts to construct artificial speech formation systems were made even before computers appeared. These were the so-called vocorders, communications systems in which the coding and restoration of speech are accomplished respectively with the help of a sound analyzer and synthesizer. The majority of these remained within the walls of laboratories; however, several were demonstrated publicly and became widely known. Thus, the Voder system was shown in an exhibition in New York in 1936 in order to focus attention on innovations in the field of telephony. To control a Voder, the operator had to carry out a of switching operations very quickly. Therefore, it was necessary to spend at least 1 1/2 years to learn to operate it. The modern computer speech synthesizer executes these switching functions together and consists entirely of one very large integrated circuit that is contained in a common housing. A microcomputer is entirely adequate for controlling the speech formation system. Therefore, the entire system may be inexpensive and have small overall dimensions. The sound quality of the synthesized voice is also acceptable, even though it is certainly not living speech that can be informative by its intonations.

The physical and mental processes of forming and comprehending speech are based on the intellectual capabilities of the human brain and are extremely complex. This is presently only understood by those who have attempted to reproduce what has been created by nature through technical means. Even though speech synthesis can be accomplished, there are still no systems

capable of understanding living speech with a dictionary consisting of several thousands of words. It may be hypothesized that the problem of automated speech recognition will be solved based on computers of the next, i.e., fifth, generation. This family of computers will be distinguished by artificial intelligence. This new quality will help then accomplish the task of information processing in an entirely different manner.

However, in general, the state of affairs in this field isn't really so bad even now. Rather a lot has been done. Industry has begun manufacturing speech recognition devices that can be connected to one automated system or another. The possibility of directly addressing technology doesn't only mean conveniences for humans. It also increases the effectiveness with which technology functions. It can prevent great misfortune in emergency situations. And this does not generally require recognition of slurred speech. It is often sufficient that the computer understand instructions compiled from components of a certain fixed dictionary. Modern speech recognition hardware deals with this successfully. True, the probability of correct recognition is not absolute. It is considered very good if a computer understands 98 percent of human speech. With respect to the reliability of inputting information into computers, speech terminal devices cannot compete with keyboard displays. Therefore, they are initially connected to systems in an auxiliary capacity, without replacing other, more usual devices.

To understand the shortcomings of speech recognition methods and hardware, it is necessary to have a general understanding of the way in which the process of recognition proceeds. It is well known that in the human hearing apparatus, oscillations of the air medium are converted and arranged into components, i.e., it is as if they are subjected to spectral analysis. The action of artificial systems for processing speech signals is for the most part based on the very same conversions, which is not very simple in and of itself, considering the signal's complexity. The point is that the signal is not stationary. Rather, its characteristics are constantly changing. Therefore, in the process of processing, it is necessary to make repeated measurements of the signal's parameters after approximately every 20 milliseconds (if a word lasts only a half a second, as much as 20 rather complex measurements of it must be taken, including spectral transformations). The set of the results of all these measurements will characterize the uttered word. The volume, rate of pronunciation of one and the same word, and the voice's tone quality are expressed to a significant degree in these measurement results. This means that the system must be rather flexible so as to give the correct response to an electrical signal ("encoded" word) that varies within a wide range.

They usually make the task easier in that they gear the system toward operation with one operator. The operator pronounces all necessary words. Combinations of specified parameters characterizing these words are input into the computer's memory and serve as prototypes for recognition. The parameters of each word pronounced in front of a microphone are compared with those the computer already "knows." Of course there will not be a complete coincidence of the pronounced and written words. Therefore, the nearest approximation of the unknown word to one of the standard words is determined, and the standard word is sent as the recognized meaning of the unknown word.

If another operator must work with the system, it must be retaught. This is rather inconvenient and difficult for practical application. However, this "sensitivity" of the technology to the individual peculiarities of speech may be used differently. For example, it is possible to verify the person speaking by using an appropriately adjusted recognition system.

Today computers are no longer what they were in the sixties. Microprocessors, microcomputers, and personal computers have created the basis for the transition to substantially new technologies for processing information in virtually all areas of human activity. Although computers were previously used as a highly productive means for making numerical computations, it is now being placed in the service of human intellect with increasing frequency. They have taken the responsibility for performing routine, monotonous mental tasks, have made access to stored and processed informtion easier, help make a decision under complicated conditions, provide for information exchange across small and great distances, and preserve a high degree of accuracy in the process. The computer has steadily acquired a new quality of artificial intelligence, thanks to which it has become able to assume such functions as the possibility of communicating with humans in a language they understand. The promise of a new role for computers has been proved by the increasing requests by their users in the world market for methods and hardware for working with speech signals.

The practical application of speed devices may be very broad. Objects with a cultural and everyday purpose have been designed on their basis, and subassemblies for voice synthesis and recognition may be built into various systems. For example, in motor vehicles, they can be used to call the driver's attention to engine or brake system failure or to an open door, etc. Or imagine a hardware system connected to measuring instruments and indicators in production where deviations from a production mode or the occurrence of an emergency situation may be prevented by a voice.

In the future, specified instructions that are sent by voice and recognized by the computer will serve as remote control for devices intended for the home (televisions, radio systems) and for production. The combined use of automated text recognition and voice synthesis is possible, particularly for oral reading of texts, which would be very helpful to people with visual disabilities.

Speech devices may make access to computer networks easier. Information computer systems equipped with them will become accessible to any telephone.

Speech computer terminals that make it possible to speed up the programming process and conduct a dialogue with a computer not only with the help of a keyboard and display screen but partly by voice already exist in our time. This list could be continued, but it is enough to show how important and necessary direct contact with technology is to modern man.

Voice communications with computers is an informatics technology of the near future that is being created right now.

12794
CSO: 1863/173

MEMORY FOR BIOCOMPUTER

Moscow TEKHNIKA I NAUKA in Russian No 11, Nov 86 pp 33-36

[Article by O. Kolin under the "In the Laboratories of Scholars" rubric: "Memory for Biocomputer"]

[Text] Biochromes, fundamentally new photographic materials of a biological origin that do not contain silver, have been created in the Biological Physics Institute of the USSR Academy of Sciences in Pushchino.

Candidate of Physical and Mathematical Sciences Nikolay Nikolayevich Vsevolodov, who is an associate at the laboratory of the ultrastructure of cellular membranes, placed an ordinary razor straightedge on a small semitransparent wafer, turned on a lamp, and as if in instant photography, an image appeared. Then the scholar covered the plate with a light filter. There was a flash of light and the image instantly disappeared.

But they aren't preparing to create photographic wafers for one-time pictures in the institute. The scholars are interested in something else: memory for a biocomputer.

It's Better to See It One Time

Any researcher who has ever worked with computers knows just how often an insurmountable obstacle arises when accomplising a task, i.e., computer memory. Or more precisely, its limited capabilities. Magnetic writing devices no longer meet the increasing requirements for volumes of information and speeds of processing them. The search for a way around this led to the idea of turning to the method chosen by nature after millions of years of evolution.

It is well known that we obtain more than 90 percent of our knowledge of the world around us with the help of vision. The volume of memory in the brain is unusually high. According to several estimates, the human brain must store 10^{20} bits of information by the eighties. Almost all of it is input at an enormous speed. The secret here is that the brain simultaneously processes signals entering from all points in the retina. It is as if there exists a set of independent parallel information input channels.

It is not suprising that it is more convenient for a person to interact with a computer with the help of visual images on a display screen. The use of the optical writing of information in computers themselves has been attempted more than once.

Naturally, in the beginning, attempts were made to use silver-containing materials for these purposes. However, in the first place, a large silver shortage has developed. Second and most important, the time from the moment of picture taking to the appearance of the image is too long. Of course, it is possible to use ordinary photographic film as a component of read-only computer memory. This has been done in several countries. But it doesn't work in on-line information processing.

Material for on-line computer writing devices must be reversible. That is, it must be possible to erase old writing and replace it be new writing repeatedly. For several decades of the search, magnetooptic films, thermoplast media, and electrooptical crystals were tried. Particular hope was placed in photochrome materials. In our country the Organic Intermediate Products and Dyes Scientific Research Institute became the center for studying them.

V.A. Barachevskiy, a sector head at the institute, says, "The enormous interest in photochrome materials arose thanks to one amazing property. If, for example, photochrome is illuminated with ultraviolet or dark blue light, it darkens. The reverse transformation occurs under red light; it lightens. Many of us are well familiar with glasses that self-darken in the sun. Their glass is made of similar materials. Many organic and inorganic substances, crystals of solids and solutions, possess photochromism."

They say that the troops of Aleksander the Great wore armbands impregnated with a photochrome solution. The change in the fabric's color in sunlight determined when to begin military actions.

Today these materials are used in copying technology for decorative purposes. The use of photochromes as components of the optical memory of computers is based on their capability to "remember." Place some small nontransparent object against the glass of self-darkening glasses. The sunlight will "write" the shadow cast by it.

It is very important that the majority of photochromes have an extremely high resolution and easily provide the density of 10,000 to 20,000 lines per millimeter that is necessary for good holographic recording. Moreover, the holographic picture will possess the property of so-called redundancy. Simply speaking, it is reliable. All the points of the surface of a medium contribute to writing each detail. This means that a malfunction in one individual section will not distort the information. In ordinary, nonholographic writing, such distortion of the picture inevitably results in the loss of several bits of information.

Unfortunately, photochrome materials have serious shortcomings. The main one is a small service life. They can endure hundreds, and in the best case,

thousands of writings and erasures, and then the memory begins to terminate. A sharp fall in light sensitivity begins.

Often the searches for new photographic materials have led to such exotic decisions that this has even been reflected in the names of conferences, for example, "Silverless and Unusual Photographic Processes." Once, photochrome materials of biological origin were discussed at one of these conferences. Associates from the Biologic Physics Institute spoke of previously unknown photochromes.

It should be stated that photochromism is well known in the world of biology. It is sufficient to name such shining examples as chlorophyll and rhodopsin. One can be assured of the fundamental possibility of writing an image with the help of light-sensitive proteins by the following experiment. If a section of green leaf is covered with some nontransparent object, then chlorophyll synthesis will stop on the shaded surface. The color of the leave will change because of this. It will become whitish. It turns out that the leaf "remembered" the form of the shadow. It is sufficient to remove the object, and the sun's rays will renew the chlorophyll synthesis and gradually "shake" the image.

Photographic films made of chlorophyll and rhodopsin already have patents. But making them is very complex and expensive. The situation changes drastically after bacteriorhodopsin was discovered.

Bacteria Photographs

In the beginning of the seventies, a protein that was striking in its amazing similarity to rhodopsin was discovered in the so-called halobacteria, which inhabit oversalted lakes and lagoons. Both turned out to be membranous proteins, and both contained retinal, a small "offshoot" of tens of amino acids. The form of retinal, its type of bond with the molecule, and even the amino acid to which it was bound, lysine, also coincided exactly. The similarity was underscored by the fact that, like rhodopsin, the protein detected by scholars changed its color in light. Hence the name bacteriorhodopsin.

This similarity led to the idea that their functions and operating mechanism must also coincide or be very similar. As is well known, the capability of rhodopsin to decay under the effect of a quantum of light stimulates the optic nerve in both animals and humans. But why do the bacteria have bacteriorhodopsin if they have no vision?

It was soon discovered that they use it for their only "energy supply" through solar energy. It would have been no less amazing a discovery had the bacteria possessed vision. The new molecule turned out to be responsible for the simplest, chlorophyll-free form of photosynthesis.

Intensive research was on the structure and mechanism of the effect of the "seeing" proteins was begun. In our country, biochemists, biophysicists, and physiologists joined efforts at the initiative of Academician Yu.A. Ovchinnikov within the framework of the "Rhodopsin" project.

As early as the first dedication of the Biologic Physics Institute I was advised to become acquainted with the works on the Rhodopsin project that were conducted in the Interfaculty Molecular Biology and Bioorganic Chemistry Problem Laboratory imeni A.N. Belozerskiy of Moscow State University, which was headed by Corresponding Member of the USSR Academy of Sciences V.P. Skulachev. He has been studying bacteriorhodopsin for less than a year.

The flash of a laser! For an instant, the plastic cell with a thin film onto which the molecule being studied has been applied is lit up by a bright light. A distinct curve is written out on the oscillograph screen in response--the curve of the photoeffect. Yes, the protein under investigation is nothing other than a molecular electricity generator.

When the English scholar P. Mitchell advanced the idea that under the effect of light bacteriorhodopsin "switches" protons inside the cell outward, thereby generating a difference in potentials on the membrane, practically nobody believed him. Mitchell received the Noble Prize for his research; however, only a few people supported him at first. Among these supporters was a group from Moscow University.

Doctor of Biologic Sciences L.A. Drachev tells us, "The distinctive feature of bacteriorhodopsin, chlorophyll, and rhodopsin is their ability to transform the energy from a solar beam into a form that may be used by a cell. Thus, it turned out that in all three cases the form of energy was electric. However, light-sensitive proteins not only have one function, but they also act according to one and the same mechanism."

Here it is necessary to digress a bit. The idea that vision in animals and the capability of green leaves to work as a result of the sun in some similar way arose earlier. For example, in the thirties, Academician S.I. Vavilov wrote the following in his well-known work "Glaz i solntse" [Eye and Sun]: "Light carries with it only one element of dimensionality, the direction of the beams that must be used by the light-sensitive organ. The leaf is drawn to the sun, the solar rays direct the leaf. Besides appearing in plants, this striving toward light appears in many bacteria, infusions, and other very simple organisms. This reaction to light and to the direction of its beams and energy may be viewed as a primitive form of vision."

"Even the discoverers of bacteriorhodopsin, the American scholars Stockenius and Osterhelt, noted that a curious change in its color occurs under the effect of light," continues L.A. Drachev. "With the help of a high-speed spectrometer it was possible to show that initially the spectral maximum is easily shifted to the red region. Then there is a sharp (occurring in the course of microseconds) shift to the opposite, dark blue region. Finally, there is a return to the intial position. The last stage proceeds more slowly than the preceding one (in tens of milliseconds)."

However, such reversible light transformations are nothing other than the photochromism about which we spoke previously. The idea of making a photographic film based on bacteriorhodopsin arose. Only it changes its color

too quickly. If only the process could be stopped in the intermediate stage. They learned how to slow it down greatly at the Biological Physics Institute.

The process of the manifestation of a difference in potentials on the membrane of the baterium is very complex; however, it may be roughly described in the form of three stages. They correspond (and this is very important) to the color transformations about which L.A. Drachev spoke. The molecule absorbed a quantum of light. Its form changes, which lead to a red shift in the absorption band. At the same time, a proton on the section of the molecule located closest to the membrane's inner surface is knocked off. As has already been stated, bacteriorhodopsin penetrates through it.

The second stage, a sharp shift in the spectral maximum to the dark blue region, corresponds to the transfer of the proton along the exit path throught the entire membrane to the outside of the cell. If only the process could be stopped at this moment! But the molecule's color changed. However, in experiments on it the third stage inevitably followed; the molecule returned to its intial state. This happened because the proton from within the cell, from the cytoplasm, was carried to a "vacant place" in the molecule.

The "charge" cycle is completed: there is one more proton on the outside of the cell than on the inside. The difference in potentials that will be used for chemical transformations has been created.

Biophysicists wondered what would happen if they could deprive bacteriorhodopsin of its usual environment, cytoplasm, which is a source of protons. It turned out that in such an anhydrous medium, it is as if the process becomes halved. The proton knocked off by the quantum of light vacates the molecule as before. Its color changes. But a new proton is needed to return the bacteriorhodopsin to its initial state. And there is none! The medium around the molecule is anhydrous, and there is nowhere from which to get a proton.

The effect could be realized on photographic materials called biochromes.

Even Boiling Water Is Not Frightening

"The first wafer made of biochrome was manufactured in 1978," noted N.N. Vsevolodov after he demonstrated it in operation (our conversation began with a description of this experiment). "It became a tradition that we demonstrate precisely this wafer for our guests. It is stored under ordinary conditions. An image has been written on it and erased thousands of times, and it is no worse than new ones. Today we have learned to produce wafers with the most diverse hues. It is possible to change the storage time for a record in a wide range of limits, from insignificantly small fractions of seconds to several weeks and months. In principle, this makes it possible for us to process information in real-time. In up to several nanoseconds with good resolution."

The creation of new photographic materials resulted from the joint efforts of scholars from several institutes. Included among these are the Bioorganic Chemistry Institute imeni M.M. Shemyakin of the USSR Academy of Sciences, the

General Physics Institute of the USSR Academy of Sciences, the Moscow Fine Chemical Technology Institute imeni M.V. Lomonosov, and others. It was possible to improve biochromes to where they are no worse than existing synthetic and inorganic photochromes, and many of their characteristics are significantly better than those of the latter.

"Film made of biochrome," continues Nikolay Nikolayevich, "is sensitive to all the parameters of a beam of light. This is more suprising to physicists than to biologists. For the latter, it is obvious that the photoreceptors of animals and bacteria must possess universal properties in order to carry out various functions in the eyes of fish, insects, and animals living in different media and having different means of vision and image processing. Moreover, the first holograms have already been produced on biochromes. It is of no little importance that the technology for manufacturing new photographic materials is well laid. It is simple, harmless, and ecologically pure. Unlike silver, bacteriorhodopsin may be produced in practically any quantity, that is to say, the source of its resources, bacteria, are renewable."

The use of biochromes as components in the main memory of a computer make it possible to work with masses of information in a fundamentally new manner. Because the image on a wafer may be erased and rewritten quickly, the operation of compilation and readout will be executed with whole "phrases," and in the future with entire pictures. A machine that thinks visually has been produced!

In the final analysis, it is possible to hypothesize the possiblity of creating a biocomputer in which there are processors based on elements of the nervous system that are supplied with biologic transducers in addition to a "biologic memory," and actuating devices will use molecular muscle contraction mechanisms.

But this remains for the distant future. Today the topic of creating "biological" optical elements for the read-only memory of a computer has become immediate. Tests have shown that high-power ultraviolet light burns out the photosensitive centers of biochromes, irreversibly changing the film's color. Therefore, the image on it may be written virtually eternally. And the use of laser technology makes it possible to attain a writing density (the theoretical limit capacity is 10^{14} bits/cm3) such that it is possible to place the text of several tens of thousands of books on a disk the size of a long-playing record.

Biochromes have a glittering future. Only the first step toward on the way toward using them has been taken.

12794
CSO 1863/174

UDC 681.324

ASYMPTOTIC ANALYSIS OF EFFECTIVENESS OF CACHE MEMORY IN MULTIPROCESSOR SYSTEMS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 1, Nov 86 (manuscript received 25 Apr 85) pp 142-151

[Article by Ya. A. Kogan, A. I. Lyakhov and S. G. Nersesyan, Moscow]

[Abstract] The use of cache memory is a major means of improving the throughput of multiprocessor computer systems. The effectiveness of cache memory is largely determined by the frequency of "hits", i.e., the number of times information which is needed is found in the cache. The frequency of hits depends on the mixture of processes performed and the organization of the cache utilization process. A model is suggested which describes the influence of input-output intensity and information interrelationships among processes running in a machine on effective mean access time in multiprocessor systems. Asymptotic equations are obtained for determination of cache memory size as a function of the type of processes performed in the computer. Figures 5, references 7: 4 Russian, 3 Western.

6508/12955
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UDC 681.322:519.25

ANALYSIS OF DYNAMIC ERRORS OF DIGITAL CONTROL SYSTEMS RESULTING FROM ASYNCHRONOUS INFORMATION EXCHANGE

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 1, Nov 86 (manuscript received 4 Jan 85) pp 152-157

[Article by A. M. Shevchenko, Moscow]

[Abstract] A study is made of digital systems in which the frequencies of digitization of the input and output signals in a control computer are constant but different and independent. A model is constructed of the process of development of dynamic error in control computers of this type, caused by differences in the frequency of interrogation of sensors and the frequency

by differences in the frequency of interrogation of sensors and the frequency of solution of the control algorithm. Statistical estimates of errors generated by this asynchronism are produced. Figures 2, references 8: 5 Russian, 3 Western.

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UDC 681.3.06

DESIGN OF DISTRIBUTED CONTROL SYSTEMS FOR LARGE ELECTROPHYSICAL INSTALLATIONS BASED ON NETWORKS OF SPECIALIZED MICROCOMPUTERS AT THE INSTITUTE OF NUCLEAR PHYSICS, SIBERIAN DIVISION, USSR ACADEMY OF SCIENCES, AND THEIR SOFTWARE

Novosibirsk AVTOMETRIYA in Russian No 4, Jul-Aug 86 (manuscript received 3 Feb 86) pp 39-45

[Article by A. N. Aleshayev, S. D. Belov, B. V. Levichev, P. S. Piskunov and S. V. Tararyshkin, Novosibirsk]

[Abstract] The authors have designed a multitasking operating system to allow the use of various programming languages, both interpreted and compiled, for the network of computers used to control physical experimental installations at the institute. Operation of these microcomputers with the CAMAC devices used at the institute is described. In 1981, smart device controllers were developed at the institute to implement the instruction system of the central computers. The resulting microcomputer devices are now widely used at the institute as controllers and work stations. These "Odrenok" microcomputers are used to implement a distributed experimental control system throughout the institute. Four systems now are in operation at the institute, each containing 6-15 "odrenok" microcomputers. Some functions are implemented at the US level, others is application programs, and the whole system has an experimental character. References 3: 2 Russian, 1 Western.

6508/12955
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UDC 681.31:001.8

SOFTWARE FOR INFORMATION EXCHANGE IN MULTIPROCESSOR INTERACTIVE "KULON" TYPE GRAPHIC SYSTEMS

Novosibirsk AVTOMETRIYA in Russian No 4, Jul-Aug 86 (manuscript received 15 Jul 85) pp 109-110

[Article by A. M. Vlasov, V. Ye. Mezhov, V. V. Plotnikov, N. L. Ratmirov and V. N. Kharin, Voronezh]

[Abstract] A study is made of the software used to support information exchange between computers in a hierarchical multiprocessor system. The "Kulon" two-level interactive graphic system utilizes two program modules for interprocessor exchange: XFR which implements the virtual terminal mode through a program channel and data transmission and reception mode through a direct access channel; and XSL, which implements the mode of receiving and transmitting data through a direct access channel in a subordinate computer. The interaction of two computers during a data exchange is analyzed. The software is sufficiently effective to control the flow of information during performance of a broad range of tasks related to planning electronic devices. References: 2 Russian.

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COMPARISON AND OPTIMIZATION OF THE REAL SPEED OF YeS COMPUTER OPERATING SYSTEMS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 1, Nov 86 (manuscript received 19 Jul 85) pp 158-165

[Article by O. I. Aven, Ya. A. Kagan and L. B. Kozinskiy]

[Abstract] Time and frequency characteristics used to estimate the time required to perform a flow of processes in single program mode are presented for three operating systems supporting batch processing on the YeS series of computers, allowing simple and unambiguous comparison of the operating systems. The operating systems studied include MVT version 6.1, SVS version 6.1 and BOS version 7.0 (operating under SVM only). Means of improving the I/O system throughput are discussed. It is noted that the possibility of improving throughput by overlap of processor and I/O operations is limited. I/O processes can be speeded up by buffering magnetic disk reads in main memory or cache memory connected to the magnetic disk controller. Figure 1, references 14: 13 Russian, 1 Western.

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DISCUSSION OF ARTIFICIAL INTELLIGENCE SYSTEMS

Tbilisi MOLODEZH GRUZII in Russian 16 Oct 86 p 3

[Article by T. Gendzekhadze, GRUZINFORM correspondent, under the "News with Commentary" rubric: "Artificial Intelligence: Fact or Fantasy"]

[Text] How can the computer be made not simply to handle somebody else's knowledge, but to store it, teach itself, and "think"? This problem was discussed at a conference of an international working group convened in Batumi under the auspices of the Commission for Computer Technology of the Academies of Sciences of the USSR and the socialist countries. Its participants, representatives of the Academies of Sciences of the USSR and the socialist countries, examined the problems of creating the hardware and software for supporting artificial intelligence systems, the prototypes of which are present-day computers.

"At the conference," the chairman of the working group, Germogen Pospelov, said, "a number of problems was touched upon. For example, these problems were considered: representing information in the computer memory, having the computer carry on a dialogue with a person so that... mutual understanding might emerge between them, so that any artificial machine or robot could learn to plan its own work. And, finally, it is important to know how and in what to instruct the future "thinking" machine.

Georgiy Avaliani, department head in the Cybernetics Institute of the Georgian SSR Academy of Sciences and candidate of technical sciences, illustrated the idea of the eminent scientist with a concrete example:

"Imagine a medical institution. A physician needs quick advice on a problem of concern to him. This usually involves looking through the appropriate literature and consulting with colleagues. Precious time is spent on finding an answer, and people are distracted. The expert system we are developing will help to provide any information to the physician quickly. It will be possible to introduce similar systems in the various sectors of the national economy."

A cooperative plan of research in the area of artificial intelligence for the next few years was approved at the conference.

/12955
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INTELLIGENT SYSTEMS: PRODUCTION AND MARKET

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 23, 2-25 Dec 86 p 7

[Article by E. Popov and D. Pospelov, both doctors of technical sciences and professors, under the "Evaluation of Trends" rubric: "Intelligent Systems: Production and Market"; first two paragraphs NTR: PROBLEMY I RESHENIYA introduction]

[Text] The value of the world inventory of intelligent systems and resources set aside for researching and developing them was $350 million last year and, according to estimates, will increase to almost $19 billion by 1990. In other words, the volume of this production will increase 5,400 percent, an unprecedented phenomenon in the history of modern economics.

What lies hidden behind these impressive figures? Properly speaking, what kind of product are we talking about? What has brought to life such tempestuous activity in the field of creating and popularizing intelligent systems?

Much is currently being said and written about new-generation computers. After Japan announced its program to create fifth-generation computers, analogous work was begun in many countries. Almost immediately international agreements concerning the development of similar research were concluded. Projects in which tens of nations were participating appeared. To put it briefly, we are speaking about the creation of computers that are highly powerful and accessible to any interested user without special training for work with computers.

In other words, the purpose of the work on new-generation computers is to remove the programmer-middleman standing between the user interested in accomplishing one task or another but unable to program and the computer itself. The programmer's function is built into the computer itself, and the user communicates with it with the help of a complex that has been termed an "intelligent interface."

The intelligent interface makes it possible to communicate with computers in natural language. It is sufficient to input the conditions of the task of interest into the computer, and the computer itself will use these conditions and program specifications as the basis for "manufacturing" a program whose

execution will give the user the answer he or she needs.

Intelligent interfaces are a means of making computers accessible to the mass user. And it is precisely they that have become the first class of intelligent systems based on knowledge. In their work, they actively use knowledge placed in them by their designers or knowledge they have accumulated while functioning. As a rule, this knowledge has an informal nature and is possessed only by experts, recognized specialists in one area of human activity or another. When intelligent systems are created, the knowledge is "confiscated" from the experts and placed into the systems' memory. Then, they are used to accomplish tasks in poorly formalized fields such as microbiology, chemistry, archeology, medicine, and geology. There thus arises another class of intelligent systems, expert systems.

It is now becoming clear that nonformalized tasks occupy a very important place in human activity, and this class of tasks is probably more important than are formalized tasks. This has determined the interest in the first protypes of expert systems that arose as soon as they appeared several years ago.

To a significant degree, it doesn't matter where these systems are used. Adjusting them for a specific subject area simply requires inputting the code of a set of pieces of knowledge about the fundamental correlations of a specified branch of knowledge and about problem-solving procedures. All the other units of expert systems will work with these pieces of knowledge by using their problem-independent procedures. If the buyer wishes, expert systems that have been called "empty" or "shells" can be filled with necessary information about one field or another that is of interest to the potential customer.

Expert systems operate in two modes, knowledge acquisition and problem solving. In the first mode, the memory of the expert system is filled with the necessary knowledge. A particular specialist performs this job, the so-called knowledge engineer. This person is not a programmer, although programming does enter his or her sphere of special interests. But besides being a programmer, this person must have mastered the methods of polling experts, as a result of which he or she is able to "extract" the necessary information from specialists. This is no simple matter since, as a rule, it is difficult for specialists to formulate their professional knowledge in more or less precise terms. The knowledge engineer must also be able to convert qualitative information obtained from experts into a form the system can understand and must have the ability of constantly monitoring the status of the knowledge base to ensure its accuracy and serviceability. The absence of knowledge engineers among developers of expert and other systems based on knowledge has more than once led to gaps in their development or has drawn out the process of developing them by several years. This is precisely why the United States and many other countries have been training knowledge engineers specially for several years. It has been suggested that this profession will soon become as ordinary as that of programmer.

Intelligent interfaces and expert systems are the most well-known class of intelligent systems today. But they are not the only ones. "Intelligence"

has also touched traditional information systems. A unit reminiscent of the intelligent interface has appeared at their input. In all cases, this unit (it is called a linguistic processor) provides the capability of communicating with the information system in a professional language. In our view, academician A.P. Yershov has aptly termed such languages "business prose languages." Business-oriented intelligent systems that make it possible to automate office processes almost entirely are beginning to be very popular. "Home secretary"-type systems that can automate a number of secretarial and business functions in the home have been created and are selling well.

Research into devices of practical interest for automating translating and abstracting works published in another language has been activated by successes in the field of intelligent systems has activated And of course, means of automating the process of designing intelligent systems themselves are actively being developed. These are usually called tool systems.

Unlike the program systems that existed before them, intelligent systems pass through several stages of existence on account of their great complexity. It is customary to separate the demonstration, research, functioning prototype, industrial, and commercial systems. When developed tool systems are present, manufacturing a demonstration prototype generally requires about half a year. Bringing a system to the research prototype stage requires no less than 1 or 2 years. A functioning prototype reliably accomplishes all tasks, but this can required too many resources and too much time. In other words, it is still ineffective, although it demonstrates all the capabilities of the future system. Such a prototype can be produced from the research prototype in the course of half a year to a year.

Thus, no less than 2 to 4 years pass only to progress from the idea of the future intelligent system to its functioning prototype. Further stages of development are related to the intention to distribute the designed system and put it in the hands of the user.

Developing an industrial prototype usually takes a year to a year and a half. It takes yet another year to develop a commercial prototype that is suitable for widescale sale. It is equipped with all the necessary documentation and additional means of making it easier for the user to work with the system.

The technology for manufacturing intelligent systems described does not make it possible to hope that a demonstration prototype will completely accomplish the task placed before the system's developer. In fact, only subsequent passage through all the stages of the technology makes it possible to obtain an effective and useful system. For this reason, of the 173 expert systems existing in the United States in 1984, 56 have remained at the demonstration level, 92 at the research level, and 12 as functioning prototypes. Four expert systems have attained the industrial prototype level, and only nine have been sold in the marketplace as commercial systems. This year there are only 40 to 50 commercial models of intelligent systems in the whole world.

In recent years, research in this field has also begun to develop widely in our country. Subdepartments geared toward creating different types of intelligent systems have been created in the USSR Academy of Sciences and many

ministries. The first prototypes of domestic intelligent systems have appeared. An expert system for diagnosing and designating the course of treating acute kidney diseases has been created in the Computer Center of the Azerbaydzhan SSR Ministry of Health, and an intelligent system for testing matriculants upon their entry into educational institutions for the purpose of discovering their professional orientation has been created in the Leningrad Polytechnical Institute. Tool systems for developing intelligent systems are being created in the Computer Center of the USSR Academy of Sciences.

But like every new thing, creating an industry to produce intelligent systems has encountered a number of difficulties. There is a catastrophic lack of specialists in this field, and they are not as yet being trained in higher educational institutions. Plans to create intelligent systems are being compiled without allowing for real times necessary to produce industrial and commerical models, which frequently leads to the discrediting of such work.

As a rule, however, those working in the field of artificial intelligence are optimists. They firmly believe that intelligent systems will obtain mass popularity in the near future.

12794
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DATABASE OF MATERIALS AND SUBSTANCES

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 20, 21 Oct-3 Nov 86, pp 1-2

[Interview with Aleksandr Dmitriyevich Kozlov, candidate of technical sciences: "All About Materials", by Yu. Popova; date and place not specified; first paragraph in boldface in source]

[Text] Somewhat more than a year ago we reported that a State Automation Database for Materials and Substances was established at the All-Union Scientific Research Center for Materials and Substances [VNITs MV] of the USSR Gosstandart [State Standards Committee] [whose address is 103155 Moscow, Novoslobodskaya ul., 67/69, tel 258-01-90]. At that time the database contained only 60 industrial-material items. What does this database consist of today? Candidate of Technical Sciences A. D. Kozlov gives an account.

Aleksandr Dmitriyevich, how much has the database grown during the past year?

--The database has increased to 1,500 substances and materials which are produced by our industries. That has been our main achievement. All of the new information was supplied to us by the material-producing ministries, such as the USSR Minchermet [Ministry of Ferrous Metallurgy], USSR Minkhimprom [Ministry of the Chemical Industry], USSR Minneftekhimprom [Ministry of the Petroleum Processing and Petrochemical Industries], USSR Minlesbumprom [Ministry of the Lumber and Paper Industry], and others. The circle of ministries and departments associated with us is steadily increasing: at the present time there are more than 20, and the transfer of property and technical characteristics data for substances to the state register at the VNITs MV has become appreciably brisker. It can be estimated that by 1990 the database will contain 25-30 thousand items and will include all of the most important materials and substances used in machine building.

What is the structure of this database?

--The thematic structure of the database is composed as follows: about 60 percent comprises data for basic construction materials--polymers, paper and wood, and metals and alloys; 30 percent is given to information about petrochemical products; and 2-3 percent of the registered total pertains to the newest substances, which have just been put into production.

Do you intend to keep these same ratios in the future?

--Not altogether. The last number is undoubtedly small for a database attempting to gain popularity with a considerable number of engineers, designers, and scientists. For the present we can offer the principal forms of retrospective information for industrial materials long in production. But many are primarily interested in new, recently-developed plastics, ceramics, metal powders, composites, and so forth, which are lightweight, strong, and economic. The data for these promising substances will help to promote the most original designs and significantly affect the levels of new technologies and machines.

Why is it that you receive so little of such information?

--The fact is that information about the addition of materials and substances goes initially to the Goskomizobreteniy [State Committee on Inventions and Discoveries]. There an inventor's certificate is issued for the "newborn." Then it is registered in accordance with all regulations, and that is a rather extended process. And only after its completion can the "legalized" substance be entered into the database. Such a path leads to a significant delay, but we are studying the possibility of speeding up the movement of information about innovations.

And are there really no Goskomizobreteniy reference books where there is information about these materials readily available for those interested?

--Actually, Goskomizobreteniy publishes a series of reference publications, for example, "Bulletin of Inventions and Discoveries." But finding essential information about new materials and substances in these publications, which are not separated out into special subject classifiers, is very complicated to do because of the huge volume of information. Together with Goskomizobreteniy, we have to speed up the timely acquisition of data relating to all that is new in the area of materials.

From our previous articles, we know that within the framework of the State Service of Standard Reference Data (GSSSD), of which your center is the main institution, there are in operation more than 20 specialized automated databases for separate groups of materials and their properties. How do you bring about interactions with them?

--These databases contain information unknown to many users. Therefore our immediate problem is to inform our visitors about the contents of the individual databases. Then it will be possible to manipulate the databases on-line at the inter-branch level. In the 12th Five-Year Plan, VNITs MV will extend the coordination of the integrated inter-branch programs of GSSSD, intended for increasing the problem-oriented database network.

Our readers ask: At the present time the data base serves one-time users. When is the central data base of substances expected to be opened up?

--Here there are still difficulties. Not all of the lists are coming to us. Some organizations have not responded at all to our inquiries, because they consider our database as not being suitable for them. Of course, we load them with additional work: the respective documents must be put together and distributed. But it is important that all understand that the more willingly they assist us, the more useful we become for every user. At the same time we are preparing to get feedback from users so that we have an idea of how we are to operate later on.

Furthermore, organizational and material-technological difficulties are holding up development. For example, we have to rent machine time to process the collected data.

However, by the end of this year or the beginning of next year, we intend to put the automated system into service and have it available for large-scale use by interested specialists.

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ENGINEER AND COMPUTER-AIDED DESIGN

Tallinn SOVETSKAYA ESTONIYA in Russian 24 Dec 86 p 2

[Article by Candidates of Technical Sciences T. Tiydemann and L. Yusti: "Engineer and Computer-Aided Design: The Theme Remains Timely; first two paragraphs in boldface in source]

[Text] Different aspects of this topic were recently discussed in this newspaper in the following articles: "From Drafting Board to Display" (31 Oct 85), "Without Routine" (24 Apr 86), and "Artificial Intelligence--Helper in Work" (10 Sep 86).

Today we will try to "sit in front of the terminal" with the authors of this article.

In their practical activity engineers do not take much of a fancy to computations. Too often, computations tie up the compressed time in which engineers must complete jobs, which compels them to avoid labor-intensive computations. This is especially true when they must repeat computations in several versions in order to arrive at the optimal decision. Many readers are familiar with the working style of the designer-machine builder who develops a product for custom or series production. They usually make only the most necessary kinematic and trivial strength computations and determine the majority of dimensions and parameters intuitively based on experience or, to put it mildly, they work "like designers." This is one of the most important reasons some new types of machines and equipment are too metal-intensive and why they are sometimes unreliable and not technologically feasible. At the same time, the reference and specialized literature proposes a whole arsenal of computational methods that are virutally unused in everyday work because of their labor-intensiveness and large information content.

Can the computer lend a hand here? Practice shows that it does so in an unsatisfactory manner. Problems of how to bring the designer and computer together (in the literal and figurative sense) and how to reduce the time from the formulation of a task to the receipt of an answer remain central.

In reality, until recently the presence of a computer in an organization assumed the creation of a computer center with corresponding personnel, microclimate, and special footwear. To obtain a computation, the designer had

to go to this center; make a request; and write down the necessary formulas, computational algorithm, and source data; argue; return; and wait for his or her request to be filled in the queue. Then after some time, the designer would receive a packet of hard-to-decipher papers filled with digits and unusual characters and would have to proceed to decode them. Then it would be necessary to repeatedly correct errors (the designer's own and those of the programmer), debug the program, and repeat the computations. All this work is only justified for the mechanization of certain standard, large-volume computations.

The configuration of a terminal or personal computer directly at the engineer's workstation is a step foward, making it possible to immediately eliminate a number of problems but, at the same time, requiring the engineer to assimilate the specialty of programming to some degree. Without a doubt, the mastery of a "second literacy" is necessary in our time and just talking about it establishes a good tone. In fact, an in-depth mastery of the existing programming languages (FORTRAN, BASIC, PASCAL) requires time, however, a lot of work, and extra training, which clearly impinges on the qualifications of the engineer in his or her specialty. In addition, at the present time the computer can only execute a small fraction of computational and design operations.

To make real progress, it is necessary, in addition to everything else, to make some of the tedious work of programming the responsibility of the computer. And this demands an increased adaptability on the computer's part, i.e., artificial intelligence.

What are the advantages of artificial intelligence and how can it help in accomplishing engineering tasks?

We'll try to explain based on the example of the MIKROPRIZ system, which was created by a group of scholars under the direction of Professor E. Tyugu from the Cybernetics Institute of the ESSR Academy of Sciences.

Using the system requires a modern desktop personal computer, for example, the Labtam or the new domestic YeS 1840. Such a computer consists of a keyboard, a cabinet with a screen the size of a medium television, and a printer. The MIKROPRIZ occupies 192 Kbytes of the computer's memory.

MIKROPRIZ differentiates capital and lower-case letters, thereby making it possible to input formulas into the computer in usual form. Following the display screen, we select the necessary computational formulas on the keyboard without worrying about converting them or their sequence. We input the values of the source quantities and request a response by pressing the question mark on the keyboard with the designation of the unknown quantity. MIKROPRIZ is itself intelligent enough to compile a decision-making algorithm, reduce an equation to the necessary form, and compute the value of an unknown quantity. The system will act reliably and effectively with 100 or more equations, whether algebraic or differential. It is possible to solve direct and inverse problems and request the value of any quantities encountered in formulas without inputting additional formulas. The system computes everything that has just been selected for computation according to the source data input.

Computations with different combinations of source data are made in an interactive mode. MIKROPRIZ itself requests the numerical values of each variable, selects the corresponding constants from previously input tables, rounds off numbers with a specified precision, etc.

The set of equations and data is given a name (for example, "block and tackle"), after which it may be written into the MIKROPRIZ file for continued storage. The name is automatically transferred into the file directory. Such a set of equations and data is named with a concept or idea. To call an existing idea up from the files, it is sufficient to enter its name on the keyboard. The idea immediately appears on the screen ready for accomplishing the next task. A multiple-use program is thereby created.

The user compiles an idea him- or herself and may include a commentary in special terms after examining it. It is possible to place an explanatory diagram or sketch on the right third of the screen alongside the formulas, which becomes a part of the concept and can be restored on the screen at any time by entering the idea's name. The idea may be changed or supplemented without cnstraints. When turning to solve a new problem, new concepts are created in an analogous manner since the files are filled systematically. In principle we can organize an unlimited number of different files of concepts with different profiles, i.e., from program packages, without a lot of labor.

One such example is a package for the computer-aided design of shafts that was developed in cooperation with the Machine Components Department of Tallin Polytechnical Institute. After data about the design components of shafts (dimensions of standard outgoing end, pivot journal, mounting surfaces, shoulders, etc.) is entered, it is possible to use a computer to quickly design a shaft of any conditional design for a gearing with any specified power. To automate the design, the computer has to "become acquainted" with the designs of several gearbox shafts. By interacting with the user, MIKROPRIZ designs a gearbox shaft and outputs to the display a scale sketch of it equipped with dimensions. Judging from the sketch, the designer can then introduce changes into the design of the shaft, let's say, increase the diameter of some stage, and a sketch of the new version will appear on the screen.

A conversation with a computer possessing artificial intelligence is carried on in the same way as a conversation with an intelligent person. If you made a mistake when prinitng the formula, let's say, used more or fewer parentheses than necessary, the system will correct the error by asking, "Is this what you had in mind?" And in the majority of cases, it's necessary to disagree with it. Upon receiving your objection, the computer will excuse itself and ask you to show it the correct way.

When getting ready to work on the computer, it is necessary to know the input language, a system of uncomplicated instructions and rules used in MIKROPRIZ, and to express yourself distincly when sending input data from the keyboard to the display, the main and read-only memory (the files), and back to the display or to the printer. It is necessary to assimilate certain fine points of the language.

The advantages of MIKROPRIZ include programming in the problem formulation stage, automatic synthesis of the decision program, and systems use of semantic memory to accumulate and store information.

Thus, a significant part of the intelligent operations at all stages of making engineering decisions using computer-aided design may be entrusted to the computer.

We think that with the appropriate training method, it is possible to learn MIKROPRIZ in a week, for example at a special seminar. It is possible to accomplish simple tasks after only a 15-minute acquaintance with the system. Complete mastery of all possible examples of the systems operation is a matter of further practice.

Let us return to the beginning of our story. Very likely, only now can the mechanical engineer say that the computer is of real use to him or her in everyday work, in accomplishing large and small tasks. It gives the engineer the capability of significantly raising the level of design. For the computer, it's all the same whether the computation being done is a simple approximate or complex refined method. A formula need only be entered once, and in MIKROPRIZ this is a simple matter. It only takes a minute to change some parameter and recalculate. Weighing the advantages of different versions of a design based on the results of computations with an increased complexity based on strength, rigidity, and vibration resistance criteria can be done quickly. On this base, it is possible to optimize designs, attaining their full strength, lightness, and reliability. The capability of obtaining graphs and sketches during computer-aided design is also essential.

The widescale introduction of artificial intelligence is still limited by a shortage of suitable domestically produced personal computers. Supplier enterprises will begin to output such computers in the near future.

A group of specialists under the direction of Corresponding Member of the ESSR Academy of Sciences E. Tyugu, a scholar of international reknown, has already spent 2 years working in the interdepartmental collective called Start, which is working to create new computers with an orientation toward using artificial intelligence.

New achievements in this field may substantially transform the work of those creating machines, designers and manufacturing engineers and raise it to a qualitatively new level.

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AUTOMATION OF DAIRY INDUSTRY

Omsk ZEMLYA SIBIRISKAYA, DALNEVOSTOCHNAYA in Russian No 9, Sep 86, p 8

[Article by M. D. Baranov, director of the IVTs [Information and Computation Center] of the Omsk APK, candidate of agricultural sciences, under the "Requires Consideration" rubric: "Afraid... of the Computer"]

[Text] Attaching great importance to breeding performance in dairy stock-raising, the goal-oriented introduction of "SELEKS", which is the system that is the most developed, promising, and best meets the requirements for accelerating the automation of livestock-breeding accounting, is taking place in a number of areas of the RSFSR and Soviet republics. By integrating animal husbandry, genetics, veterinary science, and economics, this system expedites the optimization of the production and utilization of farm animals. Such integration is necessary under conditions of labor division.

The "SELEKS" system provides: an intensive increase in the production capability of farm animals; optimization of herd breeding; and a decrease in the paperwork of breeding specialists. In conjunction with other measures it increases the production efficiency of stock-raising an average of 10% if the enterprise has operated under this system for at least three years. The productivity increase is up to 20-30% in the first and second years of operation.

Selection in cattle breeding can be effectively achieved only with accurate source data. Input documents obtained from the farms are put on punch cards. Then, after computer processing over a period of 3 to 4 hours, two copies of the data are sent to the farms. One of these stays with the breeder-livestock technologist, and replaces the milk-production book the insemination journal. These must be kept as carefully as financial records. The second copy is distributed to specialists. Part of the printout remains with the breeder-zootechnologist for making decisions with respect to each cow and to the further utilization of young stock. The printout distributed to the head veterinarian is the job authorization for the veterinary specialists for the coming month for rectal examination or medical treatment of the cows. The printout received by the farm managers and the brigade leaders serves as the job authorization for insemination and release for grazing.

In 1978, specialists in the use of computer technology in livestock raising in the CEMA countries studied the "SELEKS" system. They ascertained that the system functioning in the dairy cattle industry of the Latvian SSR is the largest and most thoroughly developed information system in the agricultural industry of the CEMA countries. The total economic gain from introducing the system into the Latvian dairy cattle industry was 1,520 rubles per 100 cows per year. A joint order of the former USSR Ministry of Agriculture and the USSR ASU [expansion in this context not known] provided for the introduction of the above system into all the republics beginning in 1979.

Without requiring any information other than that available presently at the farms, the information-computer center produces in 2 to 7 days a complete picture of the problems of large-scale selection, artificial insemination, livestock technology, veterinary activities, and the overall management of the biological processes of the livestock industry, and provides absolutely accurate accounting and bookkeeping for the overall supervision of the sections. The printouts reflect all of the processes in the life of the animal. The "SELEKS" system indicates all accounting discrepancies and errors. In short, with the new system it is clearly evident how the livestock and veterinary specialists, each milker, each farm, and the enterprise as a whole functioned during the past month.

The introduction of the new system enables specialists and supervisors of the enterprise to analyze more completely the dairy herd as well as to note the prospects of organizational matters on which work is needed. For example, information for judging, which is an operation that takes the livestock and veterinary specialists 1.5 to 2 months, can be produced for any day of the year in 2 to 3 days after the first request of the client. In fact, in an enterprise with 500 or more cows, reviewing the accumulated information for each cow is very difficult to do in a timely manner, especially since the information is scattered over many documents. That is why most livestock and veterinary specialists do not review it.

Nevertheless, the problem of introducing the system is not as simple as it might appear. Here, a single-minded joining of forces of party, Soviet, and agricultural bodies is necessary. For example, in 1984 the Omsk IVTs performed the task of introducing the "SELEKS" system into the livestock-breeding sovkhozes "Omskiy" and "Severo-Lyubinskiy" involving 2,800 milk cows. In 1985-1986, the sovkhozes "Put Ilicha", "Krasnoye znamya", "Petrovskiy", and "Pamyat Telmana" [around 18 thousand cows] were also provided with the service. For this, livestock-breeding industry accountants together with the chief livestock specialist had to supply the input information in a timely fashion to the IVTs, that is, every ten days carry out control milkings and determine the fat content of the milk. These data, however, were sent by another means. After convincing the directors of the livestock-breeding sovkhozes "Omskiy" and "Severo-Lubinskiy" that the "SELEKS" system was inadequate, they discontinued the computer service in 1986. This ignorant resolution of the problem demonstrates the power of inertia and the fact that the road to acceleration requires not only good wishes, but also active control on the part of RAPO.

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PERSONAL COMPUTERS FOR THE AGRICULTURAL INDUSTRY

Frunze SOVETSKAYA KIRGIZIYA in Russian 19 Sep 86 p 2

[Article by A. Boyko, general director PO IVTs Gosagroprom [Production Association of Information and Computer Centers, State Agro-Industrial Committee] of the Kirghiz SSR, and I. Stepanenko, manager, Cybernetics Laboratory of the Kirghiz SSR Academy of Sciences Mathematics Institute, under the "Scientific and Technical Progress in the Village" rubric: "Personal Computers for the Agricultural Industry"; first paragraph in boldface in source]

[Text] Agriculture differs from other spheres of public production in complexity of management. Here one is required to be concerned with soils and to work out-of-doors, often with insufficient time and resources. Under such conditions it is impossible to make the proper agricultural decisions without computers. In the near future they will be an integral part of the management of all subdivisions of the Gosagroprom of Kirghizia.

Throughout the republic the large EVM-1022 computer is being replaced by the more powerful YeS-1046, and additional small machines are being supplied. One of these is already set up at the main enterprise of the production association of Gosagroprom republic information and computation centers [IVTs]. Another will be set up at the Kalinin RAPO. In the fourth quarter of this year the first personal computers of the GDR-produced "Robotron-1715" type will be supplied. Next year their number will increase.

Computer technology permits sharp increases in workers' productivity in administration areas. This has fundamental significance for organizational reorganization: the role of specialists and supervisors in making optimum decisions on all internal management problems is increasing. Formerly, both the strategic directions of development and the tactical operations of an enterprise were determined from "above." Today the enterprise itself must search for the paths to profitable operation.

However, a question comes up: are the line subdivisions of the agricultural industry ready to accept the new technology and use it effectively? With large machines, the affirmative reply is unambiguous. With respect to small and micro-computers, there are a number of problems which might be unsurmountable obstacles to their introduction into operational practice. One

of these is the creation of standard software for these machines to solve specific types of management problems. Currently, there is no system in the country for handling even the central problems in industrial planning and management using small machines and personal computers of the "Robotron-1715" type. This requires interesting Gosagroprom specialists and academics in solving the software problems.

In our republic, work in this direction has already begun. Along with the workers of the Gosagroprom computer center production association and the specialists at the Kolkhoz imeni Lenin of the Alamedinskiy Rayon, colleagues of the Mathematics Institute of the Kirkhiz SSR Academy of Sciences participated in the development of a program package to manage meat and dairy industry trends using microcomputers. The work was carried out within the framework of the republic's scientific-technical program "Intentsifikatsia-90". The first ASU (Automated Management System) based on the "Robotron-1715" is planned for installation by the kolkhoz towards the end of the current five-year plan. The software for the operational conditions of the republic's economy will be tied to the analogous production trends. Solving the problem of creating applications program packages affects the following equally real problem of automating the management of the economy: who will carry out the repair and technical maintenance of the automated system.

At the start of the experimental-industrial testing of the design solutions, the Gosagroprom production association IVTs can take on this work. But subsequently? Well, for reliable computer operation, paper, inked ribbon, magnetic disks and tapes, program packages and other material resources are needed, as well as, finally, spare parts for repair and the repair itself. It appears that it will not be economical to keep an electronic engineer on the staff of each kolkhoz. It would be more reasonable to set up in the Gosagroprom of the republic a mobile service for centralized maintenance of computers. The need for it is sharply felt even today. Interruption in computer operations also has a negative effect on the economic indicators of the enterprise. Inferior and unstable computer operation inflicts irreparable and psychological damage, which creates for many users uncertainty as to the practical use of computers.

Another problem of the industrial utilization of computers in management is the staff. Despite the relative simplicity of the interaction with personal computers, their operation requires a certain amount of professional skill on the part of the user. For this reason, instruction of kolkhoz and sovkhoz specialists in the elements of programming and in working at the microcomputer console must be pivotal items in the teaching programs of the republic Gosagroprom training centers for retraining leadership personnel. The work of the regular or field classes of the Gosagroprom educational centers can help solve the problems of eliminating computer ignorance directly on the spot. Their students ought to be supervisors at all levels, and for the teaching, it would be advantageous to attract not only the agroprom IVTs colleagues, but also UVZ workers and Academy of Sciences scientists.

The Kirkhiz Agricultural Institute can also play an important role in preparing specialists of the agro-industrial complex for interaction with the computer. Today its graduates must be able to work with the computer, and to make it their real assistant. There are no doubts whatever on the part of the institute about this approach to teaching the students. Nevertheless, its realization requires additional material expenditures. Therefore the republic Gosagroprom must increase the financing of the institute and see about giving it the appropriate funds for the acquisition of computer technology and the computer-peripheral equipment set. Solving these problems is fully within its capability.

The problems of automating management at the agroprom level does not solve all possible problems in putting computers into practice. But, depending on computer technology developments and improvements in the forms and methods of managing agricultural enterprises, some of the problems will be eliminated automatically. Thus, until the creation of the microcomputer, the purchase of computers by kolkhozes was not possible, because of their production limitations on the one hand, and, on the other, simply because of high cost. Personal computers cost a fiftieth to a hundredth of the price of a large computer, and their productivity in the near future will increase greatly.

It is desirable to emphasize that the effect of the computerization of agro-industrial production can be assured only under conditions where the computer functions at all stages of management activities, right up to the brigade leader, farm managers, and field-team leaders, and not just locally with the supervisors or individual specialists. In such a system the personal computer becomes an element of the information-computational structure of the production subdivisions. It provides access to information about the state of affairs in all links of the management chain.

Removing the obstacles standing in the way of putting computers into practice must be the concern of all management levels of the republic Gosagroprom, and not only of its special services.

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SYNTHESIS OF ONE CLASS OF AUTOMATIC CONTROL SYSTEM WITH RIGID STRUCTURE AND ADAPTIVE PROPERTIES. III. SYNTHESIS OF AUTOMATIC CONTROL SYSTEM STRUCTURES FOR OBJECTS CONTAINING ELEMENTS WITH DISTRIBUTED PARAMETERS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 1, Nov 86 (manuscript received 23 May 85) pp 45-53

[Article by L. D. Lozinskiy, Moscow]

[Abstract] Previous parts of this same work analyzed the synthesis of automatic control systems for objects with concentrated parameters. This portion of the work utilizes the results of the previous parts and methods of automatic control system synthesis suggested by M. V. Meyerov for objects with delay, extending them to synthesis of automatic control systems for a class of objects containing stable elements with distributed parameters. The previous parts suggested a method of bringing the gain of regulators close to infinity, depending on the placement of amplifiers in the structure, allowing maximum reduction of limitations on the boundaries of interval polynomial coefficients. The structured approach to control system synthesis utilized in this work facilitates the transition to elements with distributed parameters. Proofs are offered for the statements which support this conclusion. Figures 3, references: 6 Russian.

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FLEXIBLE ALGORITHMS FOR DESIGN AND OPTIMIZATION OF PROGRAMMED MOVEMENTS OF MANIPULATORS

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 1, Nov 86 (manuscript received 11 Jun 85) pp 54-62

[Article by A. V. Timofeyev and A. V. Shishlov, Leningrad]

[Abstract] A new method and flexible algorithms for construction and optimization of programmed motions are suggested, supporting control of manipulators considering various limitations and obstacles. The approach developed here is based on the idea of preliminary parameterization of the programmed movements by means of cubic B-splines, allowing early satisfaction of the boundary conditions for initial and final states of the automatic manipulators, while limitations on the programmed movements are reduced to a finite system of convex inequalities in the space of movement parameters. With this approach, consideration of obstacles and limitations is performed by self-tuning of movement parameters. In contrast to other methods, the approach suggested is quite flexible with respect to changing task conditions. The advantages of the approach include the possibility of direct consideration of phase limitations, lack of any need for information on distances between manipulator elements and obstacles, simplicity of algorithms and efficient utilization of the kinematic redundancy of manipulators in optimization of movements. The studies indicate that use of the algorithms and programs developed on modern computers or microprocessors allows construction of the movements of automatic manipulators in real time even when obstacles are present. Figures 5, references 12: 11 Russian, 1 Western.

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FORMATION OF SIMILARITY RELATIONSHIPS IN SYSTEMS FUNCTIONING BY ANALOGY

Moscow AVTOMATIKA I TELEMEKHANIKA in Russian No 1, Nov 86 (manuscript received 16 Oct 85) pp 95-105

[Article by M. A. Zuyenkov, A. S. Kulguskin and A. G. Poletykin, Moscow]

[Abstract] This work continues development of a mathematical apparatus intended for formal description and work with systems acting on the base of analogies, in which decisions are made due to ordered similarity between objects, processes and situations. This article studies the problem of producing similarity relationships for prediction of membership functions by optimal matching of expert information on similarity and reliable knowledge of critical similarity in an available sample. For this purpose, concepts are introduced such as the scheme of description of an object and information

provided by an expert or description of a specific object. The formalism suggested yields the answer to two questions: What is the similarity between incompletely described objects and how can the opinion of various experts concerning the similarity of the objects be brought into agreement? The concept of information content is the key to the answers. The work illustrates the effect of the mathematical apparatus suggested on an expert system utilizing a knowledge base. References: 8 Russian.

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IMPLEMENTATION OF A LOCAL TERMINAL NETWORK

Novosibirsk AVTOMETRIYA in Russian No 4, Jul-Aug 86 (manuscript received 15 Jul 85) pp 45-49

[Article by A. G. Atamanchuk, V. I. Benevelskiy, I. I. Gracheva, N. M. Gulina, S. G. Dolgobrodov, A. N. Lodkin, P. V. Neustroyev, A. A. Oreshkin, Ye. M. Orishin, T. S. Serebrova, N. A. Seregin, B. Yu. Sokolovskiy, Ye. V. Fotyeva and A. Ye. Shevel: the authors are from Gatchina Leningradskoy]

[Abstract] A specific implementation of a terminal network used to allow any terminal to be connected to either of two YeS series computers located some 400M from each other is described. The system was designed to make maximum use of standard equipment. The terminals can operate in command or transparency mode. Commands can be used to display status, show the computers available, display programs available, show time of day, connect or disconnect the terminal to/from either computer, and shift between command and transparency modes. The structure of the software which implements these commands is described. A line-oriented text editor used in the system is also described. Implemented at the Leningrad Institute of Nuclear Physics, the network consists of an ES-1030, an ES-1060, and an SM-4 which serves as a front-end processor for both manufactures. Figures 2, references 2: 1 Russian, 1 Western.

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ORGANIZATION OF ACCOUNTING IN COMPUTER CENTERS

Moscow BUKHGALTERSKIY UCHET in Russian No 4, Apr 86, pp 25-28

[Article by V. I. Nazarchuk, junior scientific fellow, Ukrainian Department, Scientific Research Institute of Central Statistical Administration, USSR]

[Abstract] Whereas previously primary attention in the accounting at computer centers was given to the machine time provided to users, now primary attention is being turned to the output of products produced by the computer centers. The products generated by computer centers are jobs run on the machines, algorithms and programs produced by computer center personnel. The structure of costs accounted for at computer centers must also be modified to reflect the allocation of resources, personnel and consumable materials to produce the products which represent the output of the centers. Standard cost items are suggested for these purposes, corresponding to the regulated nomenclature for computer center operational costs.

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